priority filing date of April 22, 1999, which predates the Ikeda

document effective filing date of July 20, 1999. Therefore,

Ikeda is not prior art and this §102(e) rejection is believed to

be overcome.

Claims 1-5, 7, 8 and 10-15 are rejected under 35 U.S.C.

§103(a) as allegedly being unpatentable over Cobbs et al (U.S.

5,600,350) in view of Goetz et al (U.S. 5,170,416). Applicant

respectfully traverses.

The Examiner's position seems to be that Goetz et al.

discloses, regarding claim 1, the "high resolution position

detection means" as disclosed in applicant's invention.

Applicant agrees that Goetz et al. discloses a timer along with a

linear scale encoder. However, the goal of Goetz et al. is not

to provide a high-resolution position detection of test pattern

elements, but to correct "duty-cycle errors generated by

imperfections in encoder scales and encoder detectors"

(abstract). In other words, Goetz et al. may be able to provide

a perfect low-resolution position detection but fails to provide

a high-resolution position detection (see Fig. 5). For example,

when a linear scale with the resolution of 600 dots/inch is used,

applicant's system can provide a position detection at a higher

resolution, e.g. of several times the 600 dots/inch, but Goetz et

al. merely provides a "correct" position detection at the 600

dots/inch resolution. Therefore, the combination of Cobbs et al.

with Goetz et al. does not produce applicant's claimed invention.

Claims 1 and 11 are amended to further clarify this distinction,

that it is a high-resolution position that the position detecting

means or timer are for detecting. Accordingly, it is respectfully submitted that claims 1-5, 7, 8 and 10-15 define over the cited combination and are therefore allowable.

Claims 9 and 17 are allowed. The Examiner indicated that claims 6 and 16 would be allowable if rewritten to independent form. Claim 6 is so rewritten, and claim 16 depends thereon, so these claims are accordingly now in allowable condition.

The other additional prior art noted by the Examiner has been reviewed and is not believed to affect the patentability of applicant's claims.

No amendment made was related to the statutory requirements of patentability unless expressly stated herein. No amendment made was for the purpose of narrowing the scope of any claim, unless applicant has argued herein that such amendment was made to distinguish over a particular reference or combination of references.

In light of the above noted amendments and remarks, this application is believed in condition for allowance and notice thereof is respectfully solicited. The Examiner is asked to contact applicant's attorney at 503-224-0115 if there are any questions.
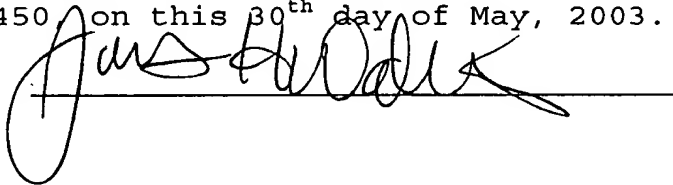
Respectfully submitted,

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I hereby certify that this correspondence is being deposited as first class mail with the United States Postal Service in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 30th day of May, 2003.

1.   (Twice Amended)   An image forming device that forms an image on a print paper in an ink jet recording method with a plurality of heads, comprising:

main scanning direction moving means for moving a carriage in a main scanning direction, said carriage having said plurality of heads mounted thereon;

paper conveying means for conveying the print paper in a sub-scanning direction;

pattern printing means for printing, with at least one head, a test pattern including predetermined pattern elements;

pattern detecting means, mounted on said carriage, for detecting the pattern elements of the test pattern printed on the print paper by said printing means;

binary conversion means for binarizing an output of said pattern detecting means;

position detecting means for detecting a position of the carriage in said main scanning direction; and

calculating means for moving said carriage to detect the pattern elements of the test pattern with said pattern detecting means, for detecting a print position of the pattern elements based on a detection result of said position detecting means when a rising and/or falling edge of a binary signal obtained by said binary conversion means is generated, and for calculating a mounting deviation amount of each head in said main scanning direction,

wherein said position detecting means comprises low-resolution position detecting means based on a linear scale provided on a movement path of said carriage and high-resolution position detecting means for detecting a high-resolution position more finely than a minimum unit determined by a resolution of said low-resolution position detecting means such that said low-resolution position detecting means and said high resolution position detection means are combined with each other to precisely detect the positions of the pattern elements.

6.   (Amended)   [The image forming device according to claim 2] An image forming device that forms an image on a print paper in an ink jet recording method with a plurality of heads, comprising:

main scanning direction moving means for moving a carriage in a main scanning direction, said carriage having said plurality of heads mounted thereon;

paper conveying means for conveying the print paper in a sub-scanning direction;

pattern printing means for printing, with at least one head, a test pattern including predetermined pattern elements;

pattern detecting means, mounted on said carriage, for detecting the pattern elements of the test pattern printed on the print paper by said printing means;

binary conversion means for binarizing an output of said pattern detecting means;

position detecting means for detecting a position of the carriage in said main scanning direction; and

calculating means for moving said carriage to detect the pattern elements of the test pattern with said pattern detecting means, for detecting a print position of the pattern elements based on a detection result of said position detecting means when a rising and/or falling edge of a binary signal obtained by said binary conversion means is generated, and for calculating a mounting deviation amount of each head in said main scanning direction,

wherein said position detecting means comprises low-resolution position detecting means based on a linear scale provided on a movement path of said carriage and high-resolution position detecting means for detecting a position more finely than a minimum unit determined by a resolution of said low-resolution position detecting means such that said low-resolution position detecting means and said high resolution position detection means are combined with each other to precisely detect the positions of the pattern elements,

wherein, for each head, said test pattern is at least one vertical bar extending in the sub-scanning direction substantially perpendicular to said main scanning direction, and

wherein said pattern printing means causes each of different portions of a single head to print a plurality of dots sequentially in a plurality of passes, said plurality of dots constituting a portion of said vertical bar.

11.   (Twice Amended)   A method, for use on an image forming device with a linear scale provided on a carriage movement path, for detecting a deviation between a print position actually printed on a print paper by a head and a print target position, said method comprising the steps of:

providing a timer for detecting a <u>high-resolution</u> position within a unit interval determined by a resolution of said linear scale;

printing a predetermined print element at the target position on the print paper by the head mounted on a carriage that scans in a main scanning direction;

detecting said print element with a sensor mounted on said carriage;

<u>when the print element is detected by said sensor,</u> detecting a low-resolution position based on said linear scale [when the print element is detected] and, detecting a high-resolution position within the unit interval with said timer[, by combining said low-resolution position with said high-resolution position]; and

obtaining the deviation between [the detected position] <u>a</u> <u>position detected by combining said low-resolution position</u> <u>detection with said high-resolution position detection</u> and said print target position.